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Pricing of multiple dosage prescription medications: An analysis of the Ontario Drug Benefit Formulary

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ABSTRACT

Objectives: This paper investigates the pricing strategy (perfect flat pricing, perfect monotonic pricing, intermediate) used for multiple dosage medications listed in the Ontario Drug Benefit Formulary.
Methods: All multiple dosage solid medications containing a single active ingredient newly listed in the Ontario Drug Benefit Formulary between 1996 and 2005 were identified. The relationship between price and dosage was calculated using a previously developed method.
Results: Seventy-three multiple dosage medications were introduced. Where medications were equivalent to existing ones in most cases companies followed the pricing strategy used by therapeutically equivalent drugs already in the formulary. Where there were no equivalent products companies did not adopt any particular pricing strategy. There was no difference in the way that companies priced scored tablets versus unscored tablets and capsules or in the way that they priced drugs that had objective measurements of efficacy/effectiveness, for example blood pressure, versus those that did not have these measurements.
Conclusions: When Monotonic pricing is used it leads to higher expenditures whereas flat pricing results in lower expenditures and offers more predictability in expenditures. Provincial governments should consider requiring flat pricing in return for formulary listing.

1. Introduction

Medications are frequently available in multiple dosage forms, that is, with different amounts of the active ingredient in a single tablet or capsule. Offering multiple dosage forms accounts for variations in human physiology, helps ensure that the product is available to a wide range of potential users and increases the potential market size for the drug. When new brand-name multiple dosage drugs are initially marketed pricing strategies, or the steepness of pricing, the companies use can range from making all of the dosages available at the same price, perfect flat pricing, to perfect monotonic pricing whereby the price is proportional to the strength of the medication, e.g., as the dosage doubles so does the price [1]. While manufacturing costs for multiple ingredient medications, biotech drugs or those in non-solid form may vary depending on the dosage, it is generally agreed that for solid forms of drugs (capsules and tablets) the marginal cost of manufacturing a different dosage is minimal [2] so that manufacturing costs do not dictate higher prices for higher dosages. In the words of one analyst, "price reflects marginal value, not marginal production cost" [2].

Public spending on prescription drugs in Canada rose by over 12% per year in the period 1997–2005 and by 2005 47% of drug expenditures were financed by the public sector [3].

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The development of measures to control drug costs is one of the nine planks in the National Pharmaceutical Strategy (NPS). According to the 2006 NPS progress report "to ensure that Canadians continue to benefit from robust public drug coverage, public dollars must be used efficiently" [4]. The introduction of new patented brand-name drugs has the second largest effect on drug sales, after the volume effect [5], and to the extent that these new brand-name drugs are sold in multiple dosages the type of pricing will impact differentially on provincial drug expenditures. Understanding how multiple dosage medications are currently priced may help provincial governments manage drug costs more effectively.

Following the methodology of Jönsson in a previous study in Sweden [1], the steepness of pricing of new brand-name drugs in Ontario was investigated in order to determine the pricing strategy that companies adopt with drugs available in multiple dosages. The pricing of the first product in a therapeutic class may determine how subsequent products in the same class are priced [6]. The primary analysis focused on how companies priced products depending on whether therapeutically equivalent products, also available in multiple dosages, were already listed in the Formulary. Specifically, there were two a priori hypotheses:

1. In classes where drugs are broadly similar in terms of effectiveness and safety, if one or more multiple dosage drugs in the class are already listed in the Ontario formulary, the price ratio of new drugs will follow the dominant price ratio in order to increase the chances of being listed.
2. If new drugs are not similar in terms of effectiveness and safety to ones already on the provincial formulary then companies will preferentially use monotonic pricing in order to increase revenue.

In addition, two secondary hypotheses were investigated:

3. Where drugs are available as scored tablets as opposed to either capsules or unscored tablets, companies will use monotonic pricing in order to avoid losing revenue due to tablet splitting.
4. Where the efficacy/effectiveness of drugs can be objectively measured, for example by measuring lipid levels or hemoglobin A1, companies will preferentially use monotonic pricing since higher prices at higher dosages can be rationalized by higher efficacy/effectiveness; where the efficacy/effectiveness of drugs cannot be objectively measured, companies will preferentially use flat pricing.

2. Methods

The Ontario Drug Benefit Program (ODBP) is a publicly run program that pays for drugs in the ambulatory care setting for seniors (≥65 years of age) and those on social assistance. Drugs covered by the plan are listed in the Ontario Drug Benefit Formulary. Edition 34 of the formulary [7], effective 1 December 1994, was hand searched and a list of all brand-name drugs available in multiple dosages was compiled. Subsequent hand searches of editions 35–39 (effective 27 May 1996 to 27 September 2005) were undertaken to determine new listings for brand-name drugs without generic competition, that were available in multiple dosages. This time period was chosen as there were no major policy changes introduced by the Patented Medicine Prices Review Board (PMPRB), the federal organization responsible for setting a maximum introductory price for new patented medications. Similarly, pricing policies at the level of the Ontario Ministry of Health were stable over the time period.

For each new listing the following items were abstracted from the relevant issue of the formulary: generic name, brand name, company marketing the medication, indication, edition of formulary, dosages and price of each dosage and presentation (capsule, tablet). In addition, it was noted whether or not there was an objective measurement of the products' efficacy/effectiveness. In some cases new dosages were subsequently introduced for drugs already available in multiple dosages. In these cases both the edition when the drug was first listed and when the new dosage(s) was listed were both recorded. Only drugs containing a single ingredient and available in solid form were included. If a drug was available in tablet form then the product identification section of the Compendium of Pharmaceuticals and Specialties [8] was used to determine if the tablet was scored or unscored.

In order to investigate whether drugs were therapeutically equivalent, the Anatomical Therapeutic Chemical (ATC) system was used to classify drugs. Drugs were put into the fourth level ATC group by searching the web site of the World Health Organization's Collaborating Centre for Drug Statistics Methodology [9]. The edition of the Ontario formulary in which the new drug was first listed was consulted to determine all of the previously listed drugs in the same fourth ATC group, i.e., all of the other drugs in the same fourth ATC group that were reimbursed by the ODBP. Decisions about whether or not the new drug was equivalent to existing ones in the same fourth ATC group were made using three sources of information: Australian Medicines Handbook [10], Medical Letter (www.medletter.com/) and Therapeutic Choices [11]. These three sources were chosen because they originate in different countries (Australia, United States and Canada) and are well recognized as objective, independent sources of information. Equivalence was defined as having the same safety profile and effectiveness.

Following the methodology of Jönsson [1] the steepness of pricing was calculated as follows: the difference in price between the highest and lowest strength, divided by the difference in strength and then divided by the price per milligram for the lowest strength. In this measure, the ratio is normalized to the lowest strength, so that the ratio is 1 at perfect monotonic pricing and 0 for perfect flat pricing.

In order to test the various hypotheses three categories of price ratios were used: 0–0.33, 0.34–0.66, 0.67–1.00. Price ratios were divided into thirds to ensure adequate numbers in each category. Using quartiles or quintiles to determine the dominant price ratio resulted in the reclassification of a single drug out of the dominant price ratio category. For all other hypotheses the results of the statis-